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(54) Title: NETWORK-BASED CONFERENCE SYSTEM
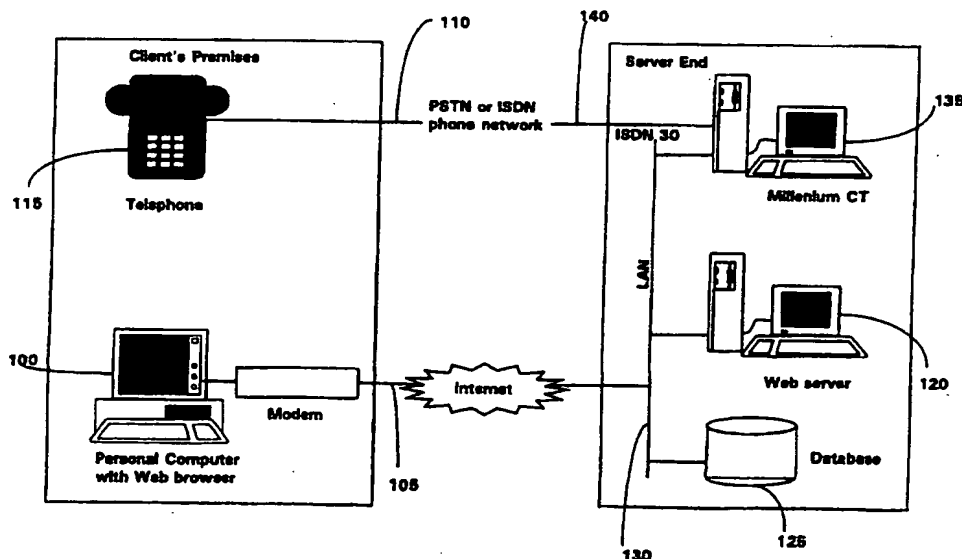
(57) Abstract

A management and control unit for a network-based conferencing system, the unit has an interface for outputting control signals to a platform for establishing audio connections across a network between users. Another interface receives control signals from a platform for providing a graphical user interface to a user, for use in controlling the conferencing system. The unit has access to a database for maintaining management data relating to one or more existing conferences. The management and control unit receives control signals input by a user at the graphical user interface in respect of an audio conference, and outputs control signals to the platform for establishing audio connections. An audio conference can thus be established between the user and at least two other users over the network. Management data can be transmitted to the graphical user interface during a conference for use in managing the conference.

NETWORK-BASED CONFERENCE SYSTEM

The present invention relates to management of network-based conference
5   systems and finds particular application in audio-conferencing with a screen-based
user interface.

Although the majority of telephony based traffic is between just two parties, the
technology to provide an audio mix between a larger number of people has existed
10   on public telephone networks for several years. Commercial services allowing 3-
way conferencing are available to users of digital exchanges and services which
allow tens or even hundreds of users to be connected into an audioconference via
operator control also exist. Telephony based audio conferencing now provides
high quality audio for groups of 10 or more and it is cheaper and less intrusive than
15   video conferencing; noise reduction algorithms have meant that the sound quality
is increasingly good. On the other hand audio conferencing systems tend to be
either expensive or awkward to use since they require either the memorisation of
arcane dual tone multi-frequency (DTMF) control codes or that users should set up
the conference via an operator.
20

Telephony, or telecommunications, in this context is the type of communication
which can be provided by means of a switch-based network and usually involves
the establishment of a particular route through a network between terminals, a
connection, by means of a set-up procedure. Communication for the course of a
25   communication session, such as a telephone call, follows the same route through
the network between the terminals. The connection is then cleared down at the
end of the communications session. This is in contrast to a data network of the
type in which packets of data may take different routes across the network and
have to be reassembled in a correct order at a receiving terminal.
30

Internet based audio conferencing applications have started to become available.
They allow groups of people anywhere in the world to talk to each other using
packet switched protocols such as Remote Procedure Calls (RPC). These systems

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According to the present invention, there is provided a management and control unit for a network-based conferencing system, the unit comprising:

i)   an interface for outputting control signals to a platform for establishing
5   audio connections across a network between users;

ii)   an interface for receiving control signals from at least one platform for providing a graphical user interface to a user for use in controlling the network-based conferencing system; and

iii)   access to a database for maintaining, including updating, management
10   data relating to one or more existing conferences

such that the management and control unit can receive control signals input by a user at the graphical user interface in respect of an audio conference, output control signals to the platform for establishing audio connections, thereby
15   establishing an audio conference connection between the user and at least two other users over the network, and output management data to the graphical user interface during an existing conference for use by the user in managing the conference.

20   Preferably the network is a telecommunications network while the interface for receiving control signals is an interface to a data network, such as the Internet. Preferred embodiments of the present invention can then enable users to enjoy high quality audio-conferencing which they can manage using a World Wide Web screen-based interface. Such embodiments can allow users to work on worldwide
25   web based material yet not require that they

i)   set up calls via an operator,

ii)   remember DTMF control codes,

iii)   invest in new telephony hardware, or

30   iv)   install specialist software.

The management and control unit can be supported by a server, such as a Web server connected to the Internet, while the graphical user interface may be

Preferred embodiments of the present invention demonstrate tight integration between software running on the client, the associated WWW server, an audioconferencing platform and a database.

5   Embodiments of the present invention allow a World Wide Web (WWW) based graphical user interface (GUI) to control a telephony based audio conference. No additional software is necessary at the client and the system can be available to any user with a Transmission Control Protocol/Internet Protocol (TCP/IP) connection to the Internet and a phone line.

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The audio conferencing system can be linked with a Worldwide Web server and its associated database.

In preferred embodiments, the system is capable of keeping track of several
15   parallel conferences each of which may involve several users. Each user can be shown the appropriate information detailing where they are on the system as well as where others are; this information can be updated whenever changes relating to a given user occur.

20   Each user can preferably control aspects of the system which they have the privileges to change. This should preferably be done without creating a conflict.

Finally the entire system is preferably designed so that users can be billed appropriately and so that it is secure against fraudulent use.
25

An audioconferencing system according to an embodiment of the present invention will now be described, by way of example only, with reference to the accompanying Figures in which:

30   Figure 1 shows a diagram of the system platform and its context;

Figure 2 shows a schematic diagram of the server side architecture for the system shown in Figure 1;

such as the Public Switched Telecommunications Network (PSTN), and a data network, such as the Internet. It accepts incoming service requests over the PSTN via an ISDN30 connection 140. It can also accept incoming service requests in other ways, for instance via a RFC1006 socket level connection as mentioned

5   above. In this case, the protocol will be implemented on both sides of the socket level link. It also provides processing capacity and it can respond to an incoming call or message by identifying and launching an appropriate computing application which calls on and manages resources to run the service requested.

10   The Millenium CT 135 is equipped with means for providing audio bridges between conference participants, in the form of digital line interface cards and controls therefor. Additionally, the Millenium CT provides speech related resources, such as recording and delivery. It therefore can provide facilities which are important in communicating with a user during conference set-up and for recording.

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For the purposes of the audioconferencing system however, any device which can accept and send commands over a network connection and use these commands to generate and record audio conferences could be used as an alternative to the Millenium CT. It should be noted there are also a number of equivalent link

20   protocols which could be used in substitution for ISDN30.

Server Software Architecture

The Server 120 may be any workstation with a WWW server and an object-
25   oriented development environment providing integrated database access. The system shown in Figure 2, provides a "WebRex" (TM) WWW server 120, an "Oracle" (TM) database 125, and a "NextStep" (TM) operating system, and four objects.

30   Referring to Figure 2, the server 120 supports an application comprising four objects. These objects 200, 205, 210, 215, are further described below. Functions within the objects are called from other objects by name; the NextStep

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CONFERENCE REQUEST table and issues the next command to the Millenium CT
135.

The messages sent to the Millenium CT 135 are:

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- Register Platform (establishes a TCP/IP connection)
- Conference Registration (register or de-register a conference with the Millenium
  CT)
- Call Dial (call a specified telephone number)
10 • Mix all Participants (mix the calls into an audio conference)
- Call Clear (remove caller from the conference)
- Record Start (start recording the conference)
- Record Stop (stop recording the conference)
- Record Delete (delete the recording)
15 • Record Save (save the recording to a file)
- Playback Start (playback the recording from the beginning)
- Playback Stop (stop the playback process)

and the commands returned by the Millenium CT 135 are:

20

- Call clear (call cleared by remote party)
- Record stop (stop recording the conference (run out of resources))

The Database Interface object 210

25 This may more simply be called the Database object 210. It provides functions for
use by the application and MAP objects 200, 205. The functions store and retrieve
information about the people who are using the system and the audio-conferences
in an Oracle database 125. The functions use embedded SQL.

30 **The Heartbeat object 215**

This logs users out if it believes the user has closed down their meeting place
window and left the system. This is further described under "The Heartbeat
Process" below.

PERSON	Information about each person such as their login name, password, on-line status (1 = logged in, 0 = logged out), personal URL (see under "Sharing URLs" below), image and conference number (if in a conference).
ADDRESS	Contains each person's telephone number

Logging onto the system

The database 125 holds information which includes the name, phone number and
5 image of each user who is registered with the system. A registered user logs onto
the system by starting up their browser 100 and then submitting a request for the
system's access URL to the server 120.

Referring to Figure 3, the user's browser 100 uses the javascript "OpenWindow"
10 command to open up a main window as well as a smaller secondary window 300
which represents the 'meeting-place'. Additionally the on-line status field in the
PERSON table in the database 125 is set to a value of 1 to indicate that they are
logged in and their 'heartbeat' is initiated (see under "The Heartbeat process"
below) by setting the heartbeat field in the PERSON table for this person to the
15 current time to initiate the heartbeat process.

The meeting-place window 300 consists of 4 frames. A column 305 on the left
shows a scrollable list of people who are logged on to the system. Beneath this,
there is a very small frame 310 which is used to control the update process. In a
20 right hand column, there is a main frame 315 which provides details about either a
person or a conference. Below this, there is a smaller frame 320 which contains
controls for recording the conference, setting privacy or sharing URLs.

As soon as a user logs onto the system, they see the names of all other users who
25 are logged on at that time as well as a list of the current conferences and their
participants in the form of a scrollable text list. The application object 200
achieves this by retrieving a list of those who are in the CONFERENCE and

and Mobility" below). There is also a button which gives the user (henceforth called the "originator") the option to set-up a conference. Once pressed, the request to set-up a conference is sent to the server 120.

5   The server 120 queues the request in the CONFERENCE-REQUEST table. The MAP object 205 subsequently retrieves the request from the table, creates entries in the CONFERENCE and PERSON-CONFERENCE tables, and instructs the Millenium CT 135 to set-up the conference using the following commands:

- Conference Registration (register a conference with the Millenium CT)
10   - Call Dial (to the originator)
- Call Dial (to the other person)
- Mix all Participants (mix the calls into an audio conference)

When the originator answers the call they are played a message telling them that
15   an audio conference is being set up and asking them to wait. When the called person answers they too are given a message telling them that a conference is being set up.

Once both parties have answered, the calls generated by the system are
20   connected together into a telephony based audio-conference and both entries in the PERSON table are updated with the conference number. The MAP object 205 updates the status field (to indicate success) in the CONFERENCE-REQUEST table in the database 125.

25   Whilst the conference is being established, the originator is shown a screen of cycling dots (generated by an animated GIF graphic) asking them to wait. Meanwhile a small secondary frame is reloaded using the client-pull HTML construct (for instance every 5 seconds). When the server receives a reload request, it inspects the status in the CONFERENCE-REQUEST table. If the status
30   indicates the conference has been set-up, it returns HTML to the updated frame which causes the entire layout of the window to be reloaded. This mechanism thus updates the meeting-place windows 300 of both people to show they are connected in a conference and deletes the request from the

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cookies for each one. In this way, the end user need never have to go through the above process.

From time to time, it may be necessary to move a computer from one location to
5 another or to use a different telephone line with a particular computer. In these circumstances, either a user or a system administrator can assess a "Phone number setting form" which contains Javascript code broadly similar to that mentioned above. The page has to be manually invoked and occupies a main window of the browser in this case. When the page is loaded, the appropriate
10 cookie is read, if there is one, and the current number and location shown. The page also contains a popup menu of legal numbers which is assembled from the database. If a new number is selected, then the existing cookie is overwritten with the updated information. The page is also reloaded which causes the changed number and location to be shown.
15

Joining an Existing Conference

The user joins an existing conference by clicking on a text link denoting the conference's number. They are then shown the list of participants in the
20 conference. There is also a button which gives the person the option to join the conference.

The server 120 queues the request in the CONFERENCE-REQUEST table. The MAP object 205 subsequently retrieves the request from the table, creates a new
25 entry in the PERSON-CONFERENCE table, and instructs the Millenium CT 135 to set-up the conference using the following commands:

• Call Dial

• Mix all Participants (mix the calls into an audio conference)

30

The system starts by making an outgoing call to the person. When the person answers the call they are played a message telling them that they are being added to the conference. Whilst the conference is being established the person is shown

The commands to the Millenium CT under these circumstances are the same as when someone joins a conference (see "Joining an Existing Conference", above). Once the person has answered the phone, they are added into the conference and 5 the meeting-place window 300 is updated for all users.

Removing a Person from a Conference

From time to time, those already in a conference may invite another user to take 10 part but in practice only reach the person's answering machine or voicemail. To recover from this situation, any of the other conference participants may clear the call to the answering machine. They do this by clicking on the name of the "person" that they want to remove in the logged-on frame. This results in a confirmation dialogue which is shown in the control frame. If the action is 15 confirmed, the system will clear the call to the answering machine and remove this "person" from the conference. The conference can then continue as normal with the remaining participants.

The commands to the Millenium CT 135 under these circumstances are as when 20 somebody leaves a conference. See "Ending a Conference" below.

Ending a Conference

Once created, a conference continues to exist as long as more than one person is 25 in it. Users can leave a conference at any time by pressing a button on the meeting-place window 300. When this happens, the Millenium CT 135 is sent the "Call Clear" command to clear the call, causing the Millenium CT 135 to drop the phone connection. The meeting-place 300 is then updated to show the person is no longer in the conference. This is achieved by updating the entry in the 30 CONFERENCE table to indicate that the displays should be updated (see "The Update Process" below).

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receives an update request from the update frame 310, it compares the time and date when it last received an update request from the update frame 310 for this user (this is called the heartbeat - see "The Heartbeat Process" below) with the time the meeting-place was last changed. If the information to be displayed has

5   changed since the last time, then a new version of the update page is sent back. This includes a javascript function which stipulates that the other frames of the meeting-place 300 should be re-loaded as soon as the update frame is itself loaded (the OnLoad event handler is used). The advantage of this approach is that it does not increase traffic to the server, load on the client or visual distraction for the

10 user by reloading all the frames even when nothing applicable to that user has changed. On the other hand it does not require multiple channels to be kept open for each user in the way that a protocol such as "server push" does.

The Heartbeat Process

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The update requests are also used as a 'heartbeat' function which lets the server know the user is still logged in ('alive'). The Heartbeat object 215 running on the server 120 polls the database 125 frequently (for instance every 30 seconds). If the heartbeat value in the PERSON table for this user is over a minute old, the

20 heartbeat object 215 deems that the user has closed down their meeting-place 300 and left the system. In such cases the user is logged out by updating their on-line status field in the PERSON table. That user will no longer appear as being on-line in other users' meeting-places.

25 ## Sharing URLs

When users are connected together in a conference they can share a URL with each other. This may be useful for instance when a person wants others who they are talking with to see the same WWW page that they are looking at. To share a

30 URL, a user either manually types or copies and pastes the relevant text string into an HTML generated text box in the control frame 320 of the meeting-place 300. The user then either presses the 'return' button or activates a 'share URL' button. This causes the URL to be associated with the user for the rest of the conference

21

indicated to the users with an auditory tone and a short voice announcement made to the conference. The recording button in the person's meeting-place is replaced by an animated 'recording-in-progress' icon (this is pressed again to stop recording). Other users are shown an animated icon indicating that a recording is

5   taking place. This is achieved by updating the entry in the CONFERENCE table to indicate that the displays should be updated (see "The Update Process" above).

When the originator presses the 'stop recording' button, a confirmation dialogue appears in the control frame. If the user confirms that they want to stop

10   the recording, the system sends 'Record Stop' and 'Record Save' messages to the Millenium CT 135. Once the recording has been saved, the animated recording icon from the person's meeting-place 300 is removed and replaced by the 'start recording' button - other users are also now shown an icon indicating that no recording is taking place. This is achieved by updating the entry in the

15   CONFERENCE table to indicate that the displays should be updated (see "The Update process" above). Subsequent parts of the conference may then be recorded if desired.

The MAP object 205 will automatically stop a recording if the last person leaves a

20   conference and the originator has not specifically stopped the recording. The recording will still be saved in these circumstances.

The Millenium CT 135 stores the recording as a 64Kbps PCM encoded speech file. The file is subsequently converted and placed on the WWW server where it can be

25   listened to by the conference participants. Preferably, the file is converted into "RealAudio 3" format thus allowing long sound files to be heard without having to first download the entire file to their computers.

Pages on the system can contain links to the RealAudio files representing

30   previously recorded conversations. Since the system uses a database to build HTML pages dynamically it is possible to provide the link to the sound file in the context of a page which indicates when the recording was made, who originated

recording by sending the Millenium CT 135 a 'Delete Recording' message. If the user leaves the private conference without saving their personal recording then the recording will be saved automatically. After choosing to save or delete a recording the user may go on to make more recordings whilst in the same conference

Privacy

The system aims to give users the greatest opportunity to see who else is logged on to the system whilst also protecting people from unwanted instrusion. This is done by allowing individuals to set their status as 'Do not disturb' and by letting the originator of a conference set up its status as 'Private'. The 'Do not disturb' status flag is stored in the PERSON table for that user whilst the 'Conference Privacy' status is stored in the CONFERENCE table for that conference. If a person registers themselves as 'Do not disturb' then others will have this status explained to them when they click on the person's picture; they will not be able to enter into a conference with that person. If a conference is private then other people will not be able to enter it and will be shown that it is private when they ask for detail on it. Both "Do Not Disturb" and "Privacy" functions are implemented with toggling on/off controls.

Another privacy advantage of embodiments of the present invention is that subscribers to a service need not disclose their phone number to other users - it is held on the database and used to dial calls to the user but need not be visible directly to others.

The Sleep Function

One of the problems to be overcome with any virtual meeting-place is that users may log on to the system and then leave their computers to go somewhere else. This can lead to other users attempting to set-up conferences with them only to be confronted with answering machines. This problem can be solved as described above under "Removing a Person from a Conference" and this is the preferred method. However, another solution to this problem is to have the database 125

25

The system provides the opportunity to bill users on the basis of subscription, usage or some combination of the two. Since all audio conferencing telephone calls are outgoing from the Millenium CT platform 135 it is possible to offer users a special tariff for exclusive use with calls to other registered users. The charging

5   structure for other general calls which the user makes need not be adjusted.

The database stores a range of allowable dialback numbers for each user. This allows people to use the service from more than one location. Since users are prevented from entering their own dialback numbers, which have to be authorised

10 by a system administrator, the potential for using the system fraudulently to obtain discounted telephone calls to any destination is removed. The database records the name of each user who initiates an audioconference, the duration of that audioconference and the names of people who took part in the conference, together with the lengths of time for which they took part. This data can be used

15 to charge the conference originator, the participants or both parties on a time basis. All such information is stored in the database 125 together with time and date stamps. The database 125 records the time and date at which each user account is created or closed down. This information can be used to facilitate subscription based charging.

20

The "Butler" Process

The butler process is intended to alert users whenever a new person comes on line, for example by playing a sound such as a bell. At this point an indicator 335

25 (e.g. a coloured dot) is also shown adjacent to the names of any newly arrived users in the frame 305 and the meeting place window is brought to the front of the browser. The indicator persists until a new update takes place or for 2 minutes - whichever period is shorter.

30   For each person's name that appears in the "logged on" frame of the meeting place a 'registerUser' javascript function is called in the layout code for the meeting place window. This function adds the name of the user in question to an array. It also checks a 'previous' array which contains a list of all those users

2.3.2   Start conference

2.3.3   Invite conference

2.3.4   Join conference

2.3.5   Leave conference

5   2.3.6   Display error message

3   Display tools

3.1   Share URL

3.2   Start recording

3.3   Stop recording

10

Referring to Figure 5, the database object 210 deals with the interface to the database 125:

1   Create conference

15   2   Get conference-request

3   Create person-conference

4   Update conference

5   Create conference-request

6   Get person-conference

20 7   Update person-conference

8   Get conference

9   Update conference request

10   Delete person conference

11   Delete conference-request

25 12   Delete conference

13   Update person

Referring to Figure 6, the MAP object 205 deals with the interface to the Millenium CT 135:

30

1   Poll conference request table

2   Start conference

3   Invite conference

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- use by fan clubs to talk about ongoing or recent events such as football matches
- application as part of a customer support system for a product or service
- use as a social meeting device
5 - use within business as a method for helping geographically separated groups to collaborate

The system can be deployed either as a small scale set-up involving PC based audio conferencing platforms such as the Millenium CT 135, or to provide larger
10 scale services on platforms such as the "integrated Speech Applications Platform" (iSAP) which has been developed by British Telecommunications plc. In the case of deployment on a PC based audio conferencing platform such as the Millenium CT 135, the overall group size on any platform is generally limited to 60 users by the system's capacity although a service can be spread over a bank of such platforms
15 running in parallel. On the iSAP, the maximum size of an individual group would again tend to be 60 (limited by the capacity of each shelf on the iSAP) although a very much larger overall user group could be catered for.

Whatever the scale of the platform on which the audio conferencing takes place it
20 is possible to implement the service in such a way that more than one separate group can share the same platform (or bank of platforms). Users in group A will see only the names of other users in group A - but not the names of users in group B or C for example. This separation can be achieved entirely through partitioning into groups in the database 125.
25

Whilst the system described above is based on standard PCs and telephones, using separate connections for voice and data, it is envisaged that the approach could be adapted to work equally effectively on systems where both datatypes were sent down the same line. This would include Internet based systems. The approach is
30 also adaptable to systems which use mobile telephony, which involve phones with built in web browsers or which use a headset connected via the soundcard of a PC rather than a separate telephone.

31

CLAIMS

1.   A management and control unit for a network-based conferencing system, the unit comprising:

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i)   an input interface, for receiving control signals from at least one platform for providing a graphical user interface to a user, for use in controlling the network-based conferencing system;

ii)   an output interface for outputting control signals for use in establishing
10   conference connections across a network between users;

iii)   an interface for providing access to a database for maintaining, including updating, management data relating to one or more existing conferences; and

iv)   control means, said control means being arranged in use:

a)   to respond to a control signal received at the input interface in
15   respect of a conference, to output one or more control signals to establish a conference connection;

b)   to output management data to the database in respect of one or more existing conferences; and

c)   to output management data from the database to the graphical user
20   interface during said one or more existing conferences for use by a user in managing the conference.

2.   A management and control unit according to Claim 1, further comprising a platform for establishing audio connections across a network between users,
25   wherein the network comprises a telecommunications network and said platform is arranged to set up conference connections in the telecommunications network.

3.   A management and control unit according to either one of Claims 1 and 2, wherein the input interface comprises an interface to a data network.

30

4.   A management and control unit according to Claim 3 wherein the unit is provided on a server which is connected to a data network.

11.   A management and control unit according to any one of the preceding claims which further comprises means for recording a conference.

12.   A management and control unit according to any one of the preceding
5   claims wherein the output control signals to the platform for establishing audio connections may further establish a single person conference.

13.   A management and control unit according to any one of the preceding claims, wherein the output management data to the graphical user interface may
10   comprise alert data, in response to the addition of a user to an existing conference, which alert data triggers the graphical user interface to provide a generic indication that a new user has joined the conference.

14.   A management and control unit according to any one of the preceding
15   claims which further comprises means for outputting an audible signal to a user.

15.   A management and control unit according to any one of the preceding claims which further comprises means for detecting an identifier for a platform for providing a graphical user interface to a user, on receipt of a control signal from
20   such a platform, and for translating the identifier to a network location for a telecommunications terminal associated with said platform, for use in establishing a conference connection to said network location.

16.   A management and control unit according to any one of the preceding
25   claims which further comprises means for responding to an update request from a platform for providing a graphical user interface to a user by reviewing whether there has been a change to data determining a screen displayed at the graphical user interface and sending update data only in the event that there has been such a change.
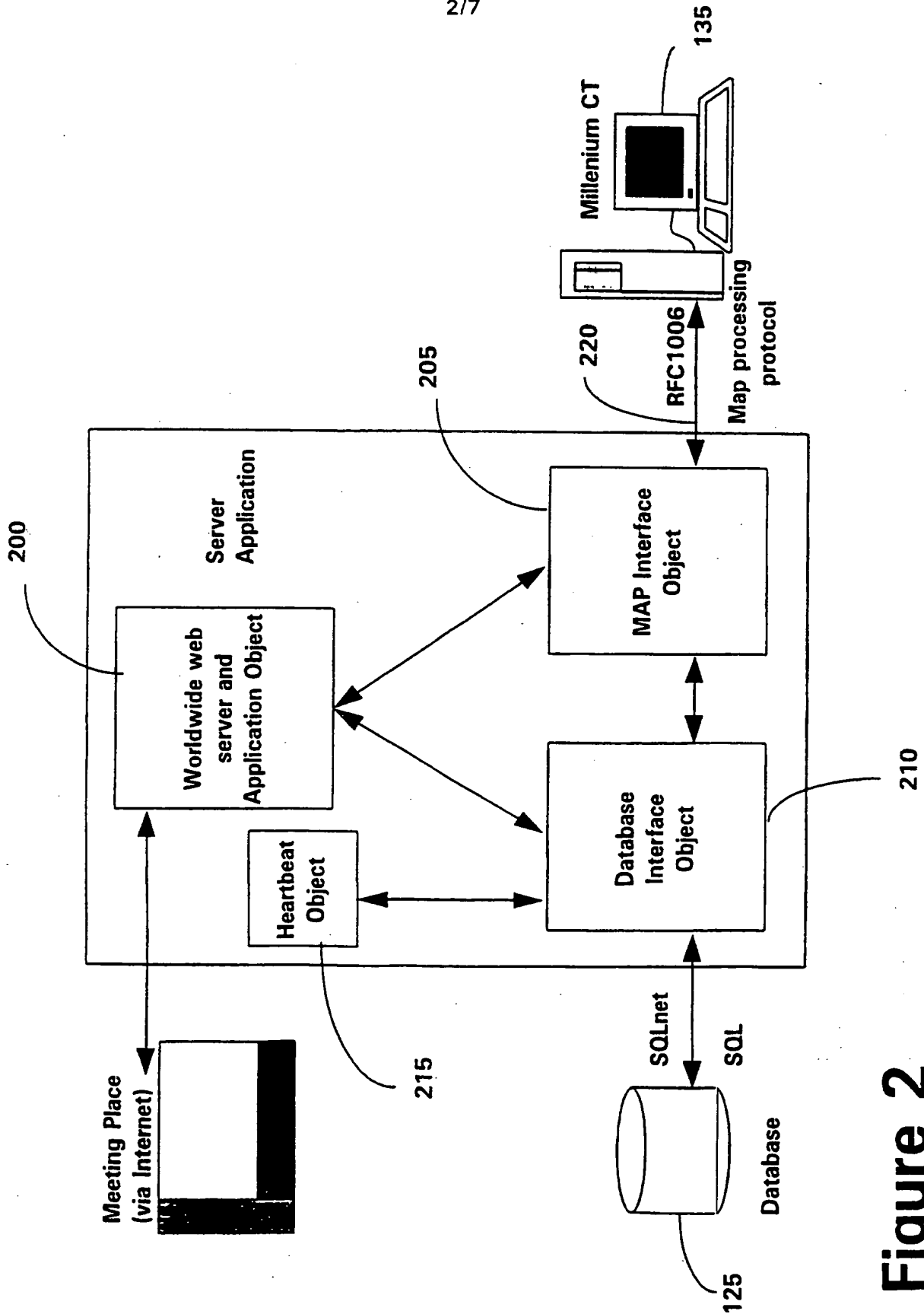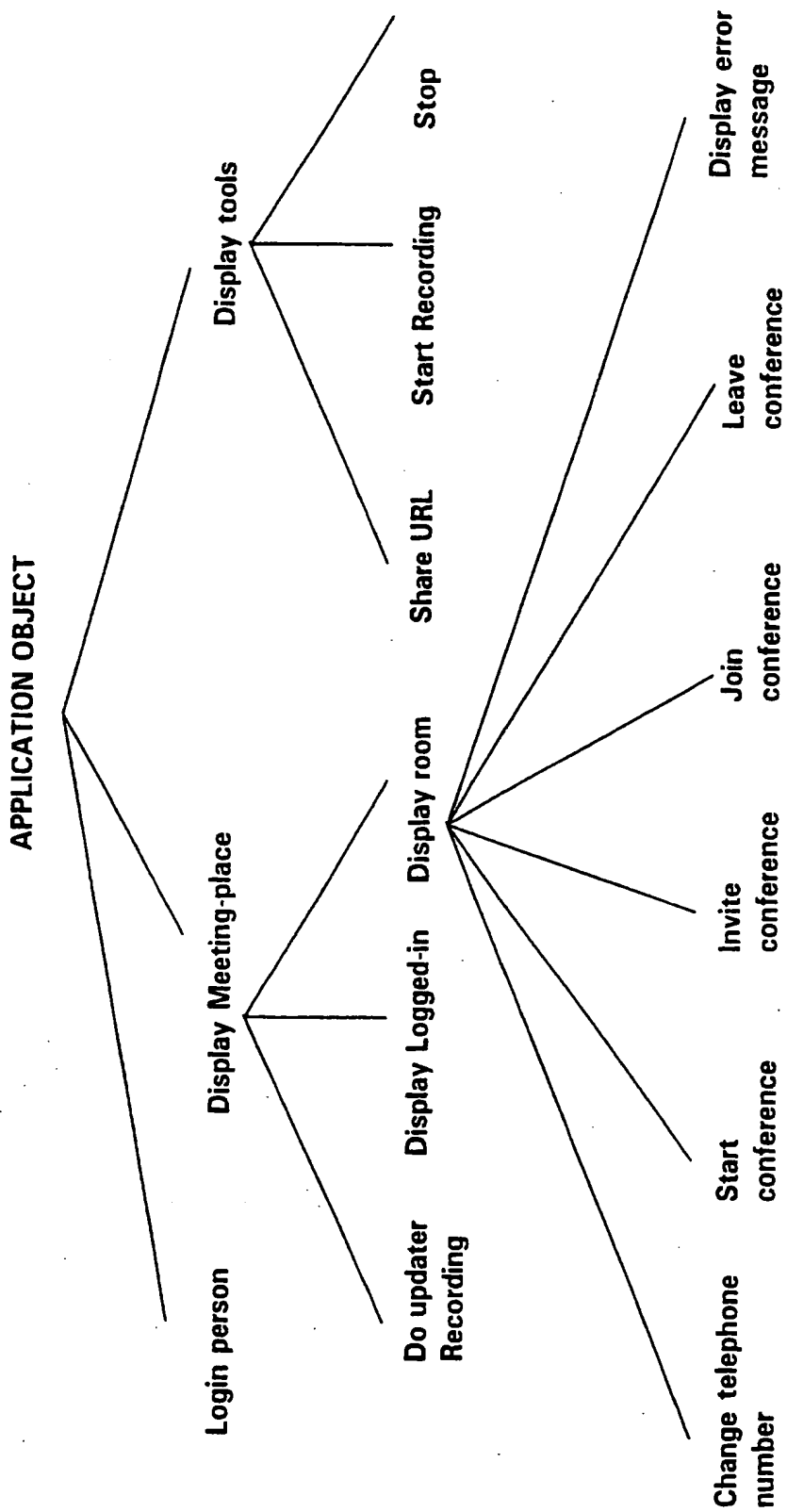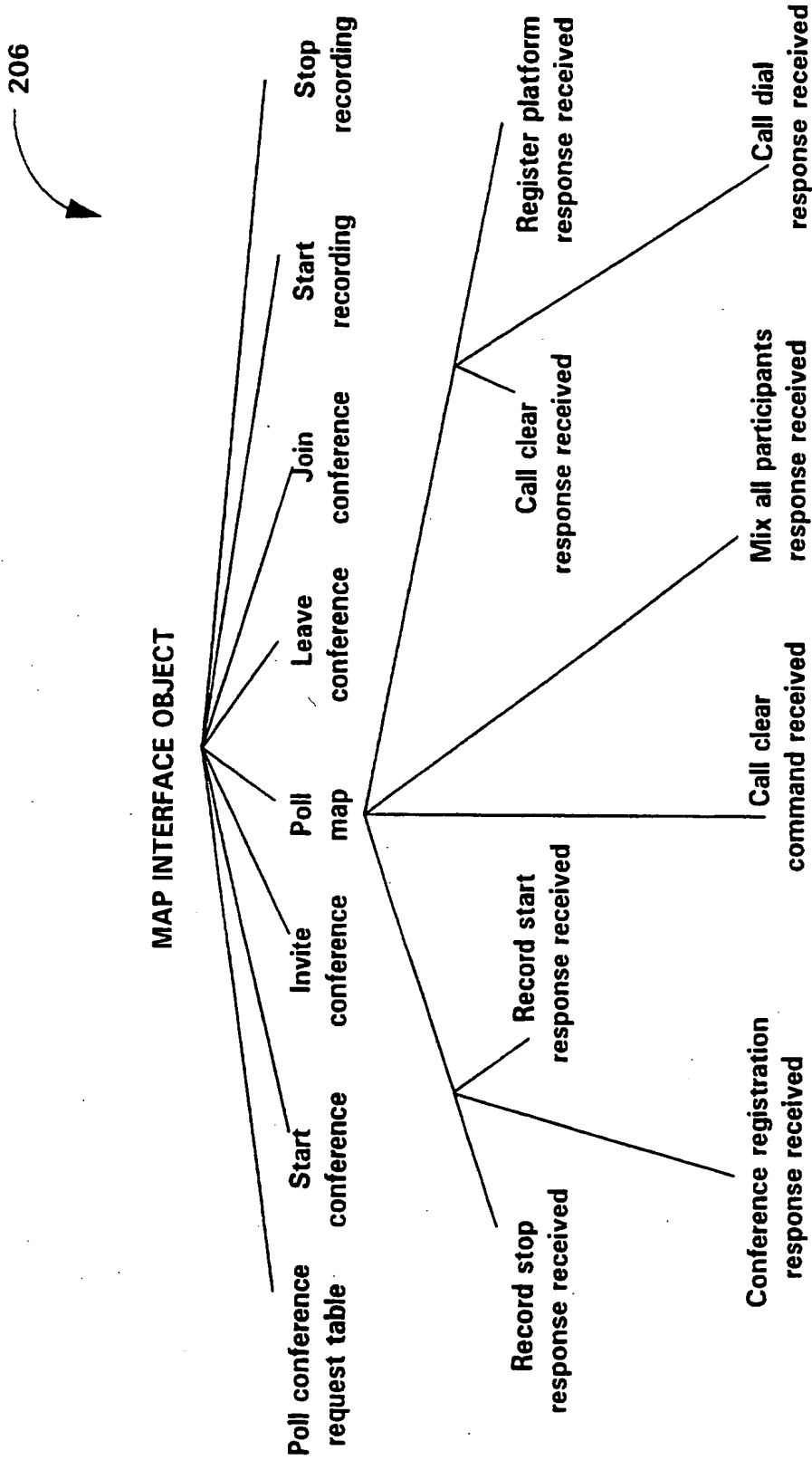
30

Figure 2

Figure 4

206

MAP INTERFACE OBJECT

Poll conference request table

Start conference

Invite conference

Poll map

Leave conference

Join conference

Start recording

Stop recording

Record stop response received

Record start response received

Conference registration response received

Call clear command received

Mix all participants response received

Call clear response received

Register platform response received

Call dial response received

Figure 6

INTERNATIONAL SEARCH REPORT

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6   H04M3/56

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 6   H04M

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
P,X	US 5 619 555 A (FENTON) 8 April 1997	1-4, 10-14
P,Y	see column 2, line 39 - column 3, line 61	5-9

Y	COLIN LOW: "THE INTERNET TELEPHONY RED HERRING" HP LABORATORIES TECHNICAL REPORT, June 1996, PALO ALTO(US), pages 1-15, XP002043901 see paragraph 6.2	5

Y	US 4 653 090 A (HAYDEN CHARLES C) 24 March 1987 see column 1, line 54 - column 2, line 20	6-9

	-/--	

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
9 February 1998	16/02/1998

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Vandevenne, M

INTERNATIONAL SEARCH REPORT

Information on patent family members

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